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Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Army										Date: February 2016		
Appropriation/Budget Activity 2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604854A / Artillery Systems - EMD							
COST (\$ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	-	1.838	1.953	1.756	-	1.756	1.800	2.155	6.998	8.754	Continuing	Continuing
509: LIGHTWEIGHT 155M HOWITZER	-	1.838	1.953	1.756	-	1.756	1.800	2.155	6.998	8.754	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Lightweight 155mm Howitzer (LW155), also known as the M777A2, provides direct, reinforcing, general support fires to maneuver forces and direct support artillery. It replaces all howitzers in all missions in the USMC and replaces the M198 howitzer as the general support artillery for light forces in the Army. The LW155 fires unassisted projectiles to a range of 15 miles and assisted projectiles to 19 miles. The addition of the digital fire control system enables the weapon to program and fire the improved Excalibur precision-guided munitions to ranges in excess of 25 miles with better than 10-meter Circular Error Probable (CEP) accuracy. The LW155 is the first ground combat system whose major structures are made of high strength titanium alloy and the system makes extensive use of hydraulics to operate the breech, load tray, recoil and wheel arms. The combination of titanium structures and the use of hydraulic systems resulted in a significant weight savings of 7000 lbs over the M198 system. Compared to the M198, the LW155 emplaces three-times faster and displaces four-times faster. It traverses 32 percent more terrain worldwide and is 70 percent more survivable than the M198. It is a successful joint service program between the Marine Corps and Army working together to develop, produce, field, and sustain the howitzer. The LW155 was first introduced into the Marine Corps in April 2005 and the Marines have now fielded the howitzer to all active units. The Army has fielded the howitzer to its Stryker Brigade Combat teams (SBCT), Fires Brigades and National Guard. Fielding of the Infantry Brigade Combat Teams (IBCT) commenced in FY14 and will continue through 2018. The LW155 saw extensive action in Afghanistan, receiving high marks for its performance. Having now been in the field for almost 10 years, the howitzer will be going through obsolescent replacement of electronic components in its digital fire control system.

Funding supports engineering studies for capabilities identified in the Joint U.S. Army, U.S. Marine Corps Operational Requirements Document (JORD) for the Advanced Towed Cannon System but deferred during Engineering Manufacturing and Development due to technology maturity, cost and schedule as well as government sustainment activities requiring RDTE. This includes a digital direct fire sight for the Digital Fire Control System; low temperature, high density power solutions; and electric elevation drives and auto loader to achieve full operational requirements. Efforts in FY2015-FY2018 center on researching technical solutions while efforts in FY2019-FY2021 will involve developing technology demonstrator prototypes.

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Appropriation/Budget Activity		R-1 Program Element (Number/Name)			
2040: Research, Development, Test & Evaluation, Army / BA 5: System Development & Demonstration (SDD)		PE 0604854A / Artillery Systems - EMD			
B. Program Change Summary (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	1.911	1.953	1.973	-	1.973
Current President's Budget	1.838	1.953	1.756	-	1.756
Total Adjustments	-0.073	0.000	-0.217	-	-0.217
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.073	-			
• Adjustments to Budget Years	-	-	-0.217	-	-0.217

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Army										Date: February 2016		
Appropriation/Budget Activity 2040 / 5					R-1 Program Element (Number/Name) PE 0604854A / Artillery Systems - EMD				Project (Number/Name) 509 / LIGHTWEIGHT 155M HOWITZER			
COST (\$ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
509: LIGHTWEIGHT 155M HOWITZER	-	1.838	1.953	1.756	-	1.756	1.800	2.155	6.998	8.754	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

The Lightweight 155mm (LW155) Towed Howitzer is a jointly managed program with the Marine Corps.

**A. Mission Description and Budget Item Justification**

The Lightweight 155mm Howitzer (LW155), also known as the M777A2, provides direct, reinforcing, general support fires to maneuver forces and direct support artillery. It replaces all howitzers in all missions in the USMC and replaces the M198 howitzer as the general support artillery for light forces in the Army. The LW155 fires unassisted projectiles to a range of 15 miles and assisted projectiles to 19 miles. The addition of the digital fire control system enables the weapon to program and fire the improved Excalibur precision-guided munitions to ranges in excess of 25 miles with better than 10-meter Circular Error Probable (CEP) accuracy. The LW155 is the first ground combat system whose major structures are made of high strength titanium alloy and the system makes extensive use of hydraulics to operate the breech, load tray, recoil and wheel arms. The combination of titanium structures and the use of hydraulic systems resulted in a significant weight savings of 7000 lbs over the M198 system. Compared to the M198, the LW155 emplaces three-times faster and displaces four-times faster. It traverses 32 percent more terrain worldwide and is 70 percent more survivable than the M198. It is a successful joint service program between the Marine Corps and Army working together to develop, produce, field, and sustain the howitzer. The LW155 was first introduced into the Marine Corps in April 2005 and the Marines have now fielded the howitzer to all active units. The Army has fielded the howitzer to its Stryker Brigade Combat teams (SBCT), Fires Brigades and National Guard. Fielding of the Infantry Brigade Combat Teams (IBCT) commenced in FY14 and will continue through 2018. The LW155 has seen extensive action in Afghanistan, receiving high marks for its performance. Having now been in the field for almost 10 years, the howitzer will be going through obsolescent replacement of electronic components in its digital fire control system.

Funding supports engineering studies for capabilities identified in the Joint U.S. Army, U.S. Marine Corps Operational Requirements Document (JORD) for the Advanced Towed Cannon System but deferred during Engineering Manufacturing and Development due to technology maturity, cost and schedule as well as government sustainment activities requiring RDTE. This includes a digital direct fire sight for the Digital Fire Control System; low temperature, high density power solutions; electric elevation drives and auto loader to achieve full operational requirements; and extended range and mobility concepts. Efforts in FY2015-FY2018 center on researching technical solutions while efforts in FY2019-FY2021 will involve developing technology demonstrator prototypes.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017</b>
<b>Title:</b> Management Services	0.194	0.197	0.199
<b>Description:</b> Funding supports management services within the Program Management Office, Towed Artillery Systems			
<b>FY 2015 Accomplishments:</b>			

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Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604854A / Artillery Systems - EMD	Project (Number/Name) 509 / LIGHTWEIGHT 155M HOWITZER		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017
Funding supported management and coordination with the Armaments Research Development and Engineering Center to conduct trade studies to determine the best material solution for the digital direct fire sight and low temperature, high density power solutions.  <b>FY 2016 Plans:</b> Funding supports management and coordination with the Armaments Research Development and Engineering Center to conduct modeling, simulation, analysis and trade studies to characterize the M777A2 for performance improvements. The data generated from these efforts will be used to establish a database to support future technology demonstrations focused on achieving current JORD objective capabilities as well as Force 2025 and Beyond Initiatives.  <b>FY 2017 Plans:</b> Funding supports management and coordination with the Armaments Research Development and Engineering Center to conduct modeling, simulation, analysis and trade studies to characterize the M777A2 for performance improvements. The data generated from these efforts will be used to establish a database to support future technology demonstrations focused on achieving current JORD objective capabilities as well as Force 2025 and Beyond Initiatives.				
<b>Title:</b> Product Development  <b>Description:</b> Funds engineering support from the Armaments Research Development and Engineering Center  <b>FY 2015 Accomplishments:</b> Funding supported conduct of trade studies to determine the best material solution for digital direct fire sight for the Digital Fire Control System and low temperature, high density power solutions to achieve full operational requirements.  <b>FY 2016 Plans:</b> Funding will support continued modeling, simulation, and analysis to characterize the objective M777A2 extended range design, analysis, and drawings. Continues XM907 common cannon assembly support.  <b>FY 2017 Plans:</b> Funding will support continued modeling, simulation, and analysis to characterize the objective M777A2 extended range design, analysis, and drawings. Continues XM907 common cannon assembly support.		1.644	1.756	1.557
Accomplishments/Planned Programs Subtotals		1.838	1.953	1.756

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<b>Appropriation/Budget Activity</b> 2040 / 5				<b>R-1 Program Element (Number/Name)</b> PE 0604854A / <i>Artillery Systems - EMD</i>				<b>Project (Number/Name)</b> 509 / <i>LIGHTWEIGHT 155M HOWITZER</i>			
<b>C. Other Program Funding Summary (\$ in Millions)</b>											
			<u>FY 2017</u>	<u>FY 2017</u>	<u>FY 2017</u>					<u>Cost To</u>	
<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>Base</u>	<u>OCO</u>	<u>Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Complete</u>	<u>Total Cost</u>
• M777 Mods: <i>M777 Mods - Modification of Weapons and Other Combat Vehicles SSN GZ1700</i>	18.166	10.070	11.913	-	11.913	3.553	3.973	3.201	13.290	Continuing	Continuing
<b>Remarks</b> Procurement Funding supports active retrofits and hardware refresh for previously contracted Digital Fire Control System components, addressing obsolescence.											
<b>D. Acquisition Strategy</b> This will be a collaborative effort between the Program Management Office, Towed Artillery Systems, and the Armaments Research Development and Engineering Center at Picatinny Arsenal.											
<b>E. Performance Metrics</b> N/A											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Army												Date: February 2016			
Appropriation/Budget Activity 2040 / 5						R-1 Program Element (Number/Name) PE 0604854A / Artillery Systems - EMD				Project (Number/Name) 509 / LIGHTWEIGHT 155M HOWITZER					
<b>Management Services (\$ in Millions)</b>				<b>FY 2015</b>		<b>FY 2016</b>		<b>FY 2017 Base</b>		<b>FY 2017 OCO</b>		<b>FY 2017 Total</b>			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	Sub Allot	Program Management Towed Artillery Systems : Picatinny Arsenal, NJ	0.000	0.194	Feb 2015	0.197	Feb 2016	0.199	Feb 2017	-		0.199	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	0.194		0.197		0.199		-		0.199	-	-	-
<b>Product Development (\$ in Millions)</b>				<b>FY 2015</b>		<b>FY 2016</b>		<b>FY 2017 Base</b>		<b>FY 2017 OCO</b>		<b>FY 2017 Total</b>			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering	MIPR	Armaments Research & Developmet Center : Picatinny Arsenal, NJ	0.000	1.644	Feb 2015	1.756	Feb 2016	1.557	Feb 2017	-		1.557	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	1.644		1.756		1.557		-		1.557	-	-	-
			Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>			0.000	1.838		1.953		1.756		-		1.756	-	-	-
<b>Remarks</b>															

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PE 0604854A: *Artillery Systems - EMD*  
Army

R-1 Line #107

R-1 Program Element (Number/Name)	Program Element Description	Program Element Type	Program Element Status	Program Element Location	Program Element Contact	Program Element Date	Program Element Notes

PE 0604854A / Artillery Systems - EMD

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2017 Army		<b>Date:</b> February 2016
<b>Appropriation/Budget Activity</b> 2040 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604854A / <i>Artillery Systems - EMD</i>	<b>Project (Number/Name)</b> 509 / <i>LIGHTWEIGHT 155M HOWITZER</i>

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
M777 Engineering Tools Development & Validation	1	2015	2	2016
XM907 Common Cannon Assembly Support	1	2015	2	2019
Objective M777ER Design, Analysis & Drawings	1	2015	2	2018
Objective M777ER Component Fabrication	2	2018	2	2019
Integration	2	2019	2	2020